

What is claimed is:

1           1.     A liquid crystal display device comprising:  
 2           a columnar spacer being interposed between a color filter  
 3 substrate and a thin film transistor substrate; and  
 4           wherein a column density of said columnar spacer is smaller  
 5 than 1 (one) and wherein said columnar spacer is disposed in two  
 6 unit pixels being adjacent to each other and said each bearing  
 7 a signal charge being opposite in polarity.

1           2.     The liquid crystal display device according to Claim  
 2 1, wherein a liquid crystal in said liquid crystal display device  
 3 is driven by a gate line reverse driving method or a dot reverse  
 4 driving method.

1           3.     The liquid crystal display device according to Claim  
 2 1, wherein said columnar spacer is disposed on a gate electrode  
 3 of said thin film transistor formed on said thin film transistor  
 4 substrate.

1           4.     The liquid crystal display device according to Claim  
 2 1, wherein a pixel electrode and a common electrode are formed  
 3 on said thin film transistor substrate in a manner that said pixel  
 4 electrode and said common electrode are insulated from each other.

1           5.     A liquid crystal display device comprising:  
 2           a color filter substrate on which a colored layer is formed  
 3 so that unit pixels are arranged in a matrix form;  
 4           a thin film transistor substrate on which thin film

0908109-1102

5 transistors are formed at a place being opposite to said colored  
6 layer;

7 a columnar spacer formed to secure a cell gap being disposed  
8 between said color filter substrate and thin film transistor  
9 substrate; and

10 wherein a liquid crystal is put into said cell gap in a  
11 hermetically sealed manner and wherein a columnar area ratio being  
12 a ratio of a cross sectional area of said columnar spacer to an  
13 area of said unit pixel is set within a range of 0.05% to 0.15%  
14 and each said columnar spacer making up a pair of said columnar  
15 spacers is disposed in each of two unit pixels being arranged in  
16 a matrix form and being adjacent to each other at an arbitrary  
17 place along a row direction or column direction.

1 6. The liquid crystal display device according to Claim  
2 5, wherein said unit pixel is driven by a dot reverse driving method  
3 when said columnar spacers are arranged along said column  
4 direction and wherein said unit pixel is driven by a gate line  
5 reverse driving method when said columnar spacers are arranged  
6 along said row direction.

1 7. The liquid crystal display device according to Claim  
2 5, wherein said columnar spacer is disposed on a gate electrode  
3 of said thin film transistor formed on said thin film transistor  
4 substrate.

1 8. The liquid crystal display device according to Claim  
2 5, wherein a pixel electrode and a common electrode are formed  
3 on said thin film transistor substrate in a manner that said pixel

09986109-110701

4 electrode and said common electrode are insulated from each other.

1 9. A liquid crystal display device comprising:

2 a color filter substrate on which a colored layer is formed  
3 so that sets of pixels each set being made up of three kinds of  
4 unit pixels including a unit pixel for a red color, a unit pixel  
5 for a green color, and a unit pixel for a blue color are arranged  
6 in a matrix form;

7 a thin film transistor substrate on which thin film  
8 transistors are formed at a place being opposite to said colored  
9 layer;

10 a columnar spacer formed to secure a cell gap being disposed  
11 between said color filter substrate and thin film transistor  
12 substrate; and

13 wherein a liquid crystal is put into said cell gap in a  
14 hermetically sealed manner and wherein a columnar area ratio being  
15 a ratio of a cross sectional area of said columnar spacer to an  
16 area of each said unit pixel is set within a range of 0.05% to  
17 0.15% and said columnar spacer is disposed both in one unit pixel  
18 making up an arbitrary one set of pixels and in another unit pixel  
19 exhibiting a same color as exhibited by said unit pixel in another  
20 set of pixels being adjacent to said one set of pixels along a  
21 column direction.

1 10. The liquid crystal display device according to Claim  
2 9, wherein said unit pixel is driven by a dot reverse driving  
3 method.

1 11. The liquid crystal display device according to Claim

09986109-110701

2 9, wherein said columnar spacer is disposed on a gate electrode  
3 of said thin film transistor formed on said thin film transistor  
4 substrate.

1 12. The liquid crystal display device according to Claim  
2 9, wherein a pixel electrode and a common electrode are formed  
3 on said thin film transistor substrate in a manner that said pixel  
4 electrode and said common electrode are insulated from each other.

1 13. The liquid crystal display device according to Claim  
2 9, wherein, when one columnar spacer is disposed in any one in  
3 one set of pixels made up of three kinds of unit pixels including  
4 said unit pixel for said red color, said unit pixel for said green  
5 color, and said unit pixel for said blue color, a column density  
6 is defined as 1/1 and wherein said columnar spacer is arranged  
7 so as to lower said column density, even when a plurality of sets  
8 of pixels is disposed in a manner that said sets of pixels are  
9 adjacent to each other, by reducing the number of said columnar  
10 spacers within a range in which said columnar area ratio is  
11 satisfied.

1 14. The liquid crystal display device according to Claim  
2 13, wherein said columnar spacer is disposed in a plurality of  
3 sets of pixels so that said column density becomes 1/2.

1 15. A liquid crystal display device comprising:  
2 a color filter substrate on which a colored layer is formed  
3 so that sets of pixels each being made up of three kinds of unit  
4 pixels including a unit pixel for a red color, a unit pixel for

09086109.110701

5 a green color, and a unit pixel for a blue color are arranged in  
6 a matrix form;

7 a thin film transistor substrate on which thin film  
8 transistors are formed at a place being opposite to said colored  
9 layer;

10 a columnar spacer formed to secure a cell gap being disposed  
11 between said color filter substrate and said thin film transistor  
12 substrate; and

13 wherein a liquid crystal is put into said cell gap in a  
14 hermetically sealed manner and wherein a columnar area ratio being  
15 a ratio of a cross sectional area of said columnar spacer to an  
16 area of each said unit pixel is set within a range of 0.05% to  
17 0.15% and said columnar spacer is arranged both in one unit pixel  
18 making up an arbitrary one set of pixels and in another unit pixel  
19 being adjacent to said unit pixel along a row direction.

1 16. The liquid crystal display device according to Claim  
2 15, wherein said unit pixel is driven by a gate line reverse driving  
3 method.

1 17. The liquid crystal display device according to Claim  
2 15, wherein said columnar spacer is disposed on a gate electrode  
3 of said thin film transistor formed on said thin film transistor  
4 substrate.

1 18. The liquid crystal display device according to Claim  
2 15, wherein a pixel electrode and a common electrode are formed  
3 on said thin film transistor substrate in a manner that said pixel  
4 electrode and said common electrode are insulated from each other.

1 19. The liquid crystal display device according to Claim  
2 15, wherein, when one columnar spacer is disposed in any one in  
3 one set of pixels made up of three kinds of unit pixels including  
4 said unit pixel for said red color, said unit pixel for said green  
5 color, and said unit pixel for said blue color, a column density  
6 is defined as 1/1 and wherein said columnar spacer is arranged  
7 so as to lower said column density, even when a plurality of sets  
8 of pixels is disposed in a manner that said sets of pixels are  
9 adjacent to each other, by reducing the number of said columnar  
10 spacers within a range in which said columnar area ratio is  
11 satisfied.

1 20. The liquid crystal display device according to Claim  
2 19, wherein said columnar spacer is disposed in a plurality of  
3 sets of pixels so that said column density becomes 1/2.

1 21. A method for manufacturing a liquid crystal display  
2 device including a color filter substrate on which a colored layer  
3 is formed so that unit pixels are arranged in a matrix form, a  
4 thin film transistor substrate on which thin film transistors are  
5 formed at a place being opposite to said colored layer and a  
6 columnar spacer formed to secure a cell gap being disposed between  
7 said color filter substrate and said thin film transistor  
8 substrate wherein a liquid crystal is put into said cell gap in  
9 a hermetically sealed manner and, said method comprising:

10 a process of forming said thin film transistor substrate  
11 by incorporating at least one thin film transistor in a surface  
12 of a first transparent insulating substrate;

13 a process of forming said color filter substrate by first

0906109-11091  
TOP SECRET

14 forming at least one colored layer on a surface of a second  
15 transparent insulating substrate being opposite to said thin film  
16 transistor and then by forming said columnar spacer on said  
17 colored layer; and

18 a process of putting said liquid crystal into said cell gap  
19 secured by said columnar spacer disposed between said thin film  
20 transistor substrate and said color filter substrate, in said  
21 hermetically sealed manner.

09936109-110701  
1 22. The method for manufacturing the liquid crystal  
2 display device according to Claim 21, wherein said process of  
3 forming said color filter substrate includes a process of first  
4 applying a photosensitive resin in a manner so as to cover said  
5 colored layer and then performing patterning on said  
6 photosensitive resin to form said columnar spacer.

1 23. A color filter substrate for being disposed opposite  
2 to a thin film transistor substrate on which thin film transistors  
3 are formed, thereby forming a cell gap between said thin film  
4 transistor substrate and said color filter substrate, wherein a  
5 liquid crystal is put into said cell gap in a hermetically sealed  
6 manner, said color filter substrate comprising:

7 a colored layer formed on a transparent substrate so that  
8 unit pixels are arranged in a matrix form; and

9 a columnar spacer is formed on said colored layer.

1 24. The color filter substrate according to Claim 23,  
2 wherein said columnar spacer is made up of photosensitive resins.